DOCUMENT RESUME

ED 459 069 SE 065 314

AUTHOR	Cortese, Anthony
TITLE	Education for Sustainability: The Need for a New Human Perspective.
INSTITUTION	Second Nature, Inc., Boston, MA.
PUB DATE	1999-00-00
NOTE	13p.
AVAILABLE FROM	Web site: http://www.secondnature.org.
PUB TYPE	Opinion Papers (120)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Ecology; Educational Change; *Environmental Education; *Environmental Influences; *Futures (of Society); Global Approach; Higher Education; Interdisciplinary Approach; Overpopulation; Physical Environment; Population Trends; Science Education; *Sustainable Development
IDENTIFIERS	Earth Summit 1992; *Stewardship

ABSTRACT

Disturbing global trends show that human activity continues to threaten our ability to meet current human needs without compromising the ability of future generations to meet their own needs. Sustainability will become more inaccessible without a dramatic change in our current mindset and behavior. As the primary centers of teaching, research, and learning, institutions of higher education are significant leverage points that reflect and inform social mindsets. Unfortunately, the current educational system educates our young in a manner that reinforces an environmentally ignorant and/or insensitive mindset. Conventional logic and compartmentalization continue to be manifested throughout higher education institutions. A fundamental structural problem of the current educational system is the inclination to treat environmental education as yet another specialty but the training of specialists is not an adequate response to the environmental problems faced; teaching and learning predominantly takes place in the classroom rather than being balanced by experiential and service learning opportunities. Institutions of higher education bear a profound moral responsibility to increase society's ability to create a just and sustainable future. The question that arises at this point is, What would a college or university that addressed the environmental crisis with intensity and ingenuity look like? (PVD)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 459 069

Second Nature
Education for Sustainability

Home
Vision
About
Resource Center
Resource Guides
Faculty
Students
Administrators
Workshops
Contact Us
Site Map

A. Cortese

1

U.S. DEPARTMENT OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Resource Guides > Faculty Guide > Writings

Education for Sustainability: The Need for a New Human Perspective

by Anthony Cortese, President, Second Nature

The Societal Crisis

Disturbing global trends continue to evidence the fact that human activity threatens our ability "to meet the needs of the present without compromising the ability of future generations to meet their own needs." This goal of sustainability, as defined by the Brundtland Commission in 1987, will become more inaccessible without a dramatic change in our current mindset and behavior.

In the last five decades, the population of the world has more than doubled to 6 billion people and the world's economic output has increased nearly sixfold (1). This unprecedented growth is altering the face of the earth and the composition of the atmosphere. Pollution of air and water, accumulation of wastes, destruction of forests, erosion of soils, depletion of fisheries, and damage to the stratospheric ozone layer threaten the survival of humans and thousands of other living species. In Changing Course: A Global Business Perspective on Development and the Environment, Stephan Schmidheiny, chairman of the Business Council for Sustainable Development, points out that we are a society living off its natural capital, not its income. We are acting like a planet in liquidation. In essence, humans are conducting an uncontrolled experiment, unprecedented in scope and scale, that represents a significant reversal of the natural evolution which produced clean air and water and the increasingly complex and diverse ecosystems which made human evolution possible.

These trends prompted a United Nations Conference on Environment and Development in Rio in 1992. The Rio Conference produced a declaration of action, Agenda 21, as well as some treaties and conventions to move society on a sustainable path. Also recognizing that these trends placed humankind at a profound crossroads, scientists around the globe, including 102 Nobel laureates, signed the World Scientists' Warning to Humanity in 1992, which read in part:

> Human beings and the natural environment are on a collision course. Human activities inflict harsh and often irreversible damage on the environment and on critical resources. If not checked, many of our current practices put at serious risk the future that we wish for human society and the plant and animal kingdoms, and may so alter the living world that it will be unable to sustain life in the manner that we know. Fundamental changes are urgent if we are to avoid the collision our present course will bring about.
>
> WARNING - We the undersigned, senior members of the world's scientific community, hereby warn all humanity of what lies ahead. A great change in our stewardship of the earth and the life on it is

SE 005 314

2

BEST COPY AVAILABLE

required, if vast human misery is to be avoided and our global home on this planet is not to be irretrievably mutilated.

Despite these warnings and the rhetoric of commitment to address environmental problems, since the Rio Conference in 1992, all of Earth's living systems have continued to decline. Moreover, the degradation of natural systems is likely to accelerate with the addition of 78 million people to the planet each year unless strategies to meet human needs are made more sustainable and just. Currently, 83 percent of the world's resources are being consumed by 20 percent of the world's population. The world's poorest 20 percent earn 1.4 percent of the world's income. According to the UN Development Programme, the income ratio of the richest 20 percent to the poorest 20 percent was 30:1 in 1960; it was 61:1 in 1994 (2). For 30 percent of the world's population, poor sanitation, malnutrition and air pollution are still the major causes of illness and death. The rural poor continue to migrate and become transformed into an urban poor, thereby exacerbating environmental health and social problems. By the year 2005, for the first time in history, more people will live in urban than in rural areas (3).

By the time population growth stabilizes in the next century, a five- to sevenfold increase in consumption of energy and goods will be needed just to raise the consumption level in the developing world to that in the industrialized world. Agricultural production must increase two- to threefold in the next forty years for all humans to have adequate nutrition -- yet we are already appropriating the most productive 40 percent of the land-based biomass for human purposes. Simply to maintain the current unhealthy levels of pollution and waste loadings will require an 80-90 percent reduction in pollution generated per unit of economic output (4).

Furthermore, the world will need an unprecedented 2 billion jobs in the next twenty to thirty years to employ the current 800 million underemployed and unemployed people and the new job seekers that will enter the market (5). This cannot be done with economic activity that substitutes capital for labor, consumes large amounts of materials and energy and creates large volumes of pollution and waste, particularly when we have geometric growth in population. Paul Hawken, author of Ecology of Commerce, points out that with a quintupling of population and an over 100-fold increase in economic output we have the reverse of the situation at the start of the industrial revolution which was an abundance of natural resources and the ability of the biosphere to assimilate wastes. "Our thinking is backwards: we shouldn't use more of what we have less of (natural capital) to use less of what we have more of (people)."

Finally, there is increasing social and political instability worldwide despite the end of the cold war and the increased globalization of the economy (which many argue contributes to instability). This situation will be exacerbated, according to Worldwatch Institute, by the conservatively estimated, yet still unprecedented, 27 million migrants and environmental refugees moving to urban centers and from east to west and south to north (6).

Our response to the situation described above has been irresponsible and dangerously inadequate. The current ideology of growth has captured our imagination to the degree that we continue to believe that more of the same resource intensive and pollution creating economic growth remains the best way to serve common good. This belief is advanced despite evidence that such "growth" undermines the life support systems upon which all human activity depends. Attractive and promising alternatives to

conventional economic growth do exist. In fact, there is no inherent conflict between protecting the environment and a strong human economy since the environment is the support system for all human activity. As Peter Dunne said in a New York Times editorial, "The environment is not a competing interest; it is the playing field on which all other interests intersect."

The patterns and trends described above confirm the need for a new human perspective. Our vision of a just and sustainable society must be informed by the ecological perspective that humans are part of nature and that all social, economic and environmental systems are interdependent. This perspective immediately reveals that perpetual growth as the defining characteristic of a healthy society is no longer tenable. Rather, a sustainable society is one which measures its development in qualitative as well as quantitative terms, often seeking the virtue of enough rather than more. The steady-state economic theories of Herman Daly and the work of Paul Hawken, Amory and Hunter Lovins and hundreds of others, for instance, reveal the possibility of enjoying prosperous lifestyles while cultivating justice, equity, diversity, integrity and health in both human and nonhuman communities.

The sustainability paradigm reveals rich and attainable alternatives to our current patterns of behavior. All present and future humans can be healthy, have their basic needs met, have fair and equitable access to the earth's resources, have a decent quality of life and preserve the biologically diverse ecosystems on which we all depend. Realization of this goal demands, first, that we recognize there is a problem. Few credible voices can be heard at this point denying the urgency of our global situation. Secondly, we must be able to envision and articulate the future we want for ourselves. This provides a starting point from which to actively construct our future. Merely dwelling on the crisis at hand without engaging in the challenging work of remedying the crisis is to act irresponsibly. The following section, "Envisioning a Just and Sustainable Future," attempts to take the necessary next step in the effort to realize a just and sustainable future.

Envisioning a Just and Sustainable Future - Creating Solutions

A necessary step in the transition to a sustainable path is to shift from problem-solving to creating. Problems are negative things which we would like to eliminate. However, eliminating the problem does not necessarily get us what we want. We often frame problems in such narrow ways that the solutions are not lasting and may create other problems later on or in some other place. The way we have dealt with most environmental issues such as air or water pollution is to view them as discrete problems with solutions which often end up moving pollution around rather than getting to the root of the problem and eliminating it. Creating, on the other hand, is bringing into existence some thing or situation that we want -- which is usually a much better motivator for change than a problem we need to eliminate.

Creating a sustainable future demands that we be able to define and understand in a concrete, substantial and just way what sustainability means. The Natural Step (TNS) helps us define the minimal conditions for sustainability which, in turn, act as guiding principles, or a "compass," for our decision-making. The Natural Step is a nonprofit environmental education organization working to build an ecologically and economically sustainable society. TNS offers a framework that is based on science and serves as a compass for business, communities, academia, government

entities, and individuals working to redesign their activities to become more sustainable.

The TNS framework helps individuals and organizations address key environmental issues from a systems perspective. It gives people a common language and guiding principles to help change existing practices and decrease their impact on the environment. The system conditions are used as a shared mental module for problem-solving, for the development of consensus documents, to structure institutional scientific work at universities, in course curricula for teaching students, and by corporations, municipalities, and other organizations as an instrument for strategic planning towards sustainability (7).

The Natural Step: The Four Systems Conditions

1. Substances from the Earth's crust must not systematically increase in the ecosphere.

2. Substances produced by society must not systematically increase in the ecosphere.

3. The physical basis for productivity and diversity of nature must not be systematically diminished.

4. Fair and efficient use of resources with respect to meeting human needs.

Translated into action, these four conditions mean that:

> [1] fossil fuels, and other minerals must not be extracted at a faster pace than their slow redeposit and reintegration into the Earth's crust, otherwise, the concentration of substances will increase and eventually reach limits -- often unknown -- beyond which irreversible changes occur.
>
> [2] Substances must not be produced at a faster pace than they can be broken down and integrated into the cycles of nature or deposited into the Earth's crust, otherwise the concentration of substances in the ecosphere will increase and eventually reach limits -- often unknown -- beyond which irreversible changes occur.
>
> [3] We cannot harvest or manipulate ecosystems in such a way that productive capacity and diversity systematically diminish, because our health and prosperity depend on the capacity of nature to reconcentrate and restructure wastes into new resources.
>
> [4] Basic human needs must be met with the most resource-efficient methods possible, and their satisfaction must take precedence over provision of luxuries, because humanity must prosper with a resource metabolism meeting system conditions 1 through 3. This is necessary in order to obtain the social stability and cooperation for achieving the changes in time. (8)

How do we create a life that allows all present and future humans to be healthy, have their basic needs met, have fair and equitable access to the earth's resources, have a decent quality of life and preserve the biologically diverse ecosystems on which we all depend? Future scientists, engineers, and business people must design technology and economic

activities that sustain rather than degrade the natural environment, enhance human health and well-being, and mirror and live within the limits of natural systems.

A more concrete vision of a sustainable future is one in which:

The world population is stabilized at a level that is within the short- and long-term carrying capacity of the earth's finite resources. This level is of great debate and is probably between 8 and 9 billion people.

Resources are used efficiently. Leading organizations such as the Wuppertal Institute and the Factor 10 Club and a growing number of individuals such as Ernst von Weizsacker, Paul Hawken and Amory Lovins have been calling for a huge increase in resource productivity by a factor of 4 to 10 in order to increase wealth for four-fifths of the world's population and to decrease environmental impact. This is critical because the industrialized economy is incredibly wasteful in use of resources while the planet has a finite amount of resources and a finite ability to absorb and process wastes. According to a recent report of the World Resources Institute, industrialized countries extract forty-five to eight-five tons of materials per person per year. A recent report of the US National Academy of Engineering indicates that 93 percent of all the material which enters into commerce becomes waste before the product reaches the consumer. Paul Hawken estimates that 80 percent of the remaining 7 percent which is embedded in the products goes to waste within six weeks of use. For example, only 3 percent of the energy produced by a nuclear or coal-fired power plant to power an incandescent light bulb actually results in light! Moreover, Hawken estimates that if one were to include energy, water and biologically-based materials each person in the United States consumes their body weight in natural resources daily (9).

Such inefficiency and wasteful consumption continue, however, not because of the absence of attractive alternatives. In their recently released book Factor Four: Doubling Wealth, Halving Resource Use, Ernst von Weizsacker and Amory and Hunter Lovins call for a revolution in energy and resource productivity and provide over fifty demonstrated examples of factor 4 increases in energy, material and transportation productivity from a variety of institutions around the world. With a few exceptions they all cost less than conventional means of doing business and increased social and economic as well as environmental sustainability.

One energy example, in particular, illustrates the challenges and the possibilities ahead. From 1973 to 1986, the United States economy grew by 40 percent, yet energy consumption did not increase. Higher prices in oil led to industrial conservation and government efficiency standards for automobiles, refrigerators and electric motors. The result is that the economy saved $160 billion a year -- and there is still room for improvement. Germany and Japan obtain twice as much economic output per unit of energy consumed as the US and ten to twelve times as much as China. Since 1986 the price of oil has fallen to an historical low due to the success of conservation. As a result, in the United States, the size (witness the growth in gas guzzling sport utility vehicles (SUVs) which now make up 45 percent of new car sales) and number of automobiles and the number of miles driven has continued to grow at a rate of 3 percent per year, driving energy consumption up steadily each year. The United States now imports more oil just for gasoline than the total amount of oil imported during the 1973 oil crisis (10).

We will mirror and live within natural systems. Humans are the only

species on Earth that produce waste which is not a raw material or nutrient for another species. We are the only species to produce wastes that can be broadly toxic and build up for long periods of time. As William McDonough, Dean of the University of Virginia School of Architecture, has said, a sustainable society would eliminate the concept of waste. Waste is not simply an unwanted and sometimes harmful by-product of life; it is a raw material out of place. Waste and pollution demonstrate gross inefficiency in the economic system since they represent resources that are no longer available for use and/or create harm in humans and other species.

A sustainable economy would mirror nature's "circular" method of using matter and employ the concepts of design through which all waste would be the "food" (waste = food) for another activity. This idea is illustrated in the concept of industrial ecology.

Metal extraction and conversion would be replaced by strategies to continuously cycle existing metals through the economy. For example, recycling aluminum rather than using virgin bauxite ore cuts energy use by 95 percent and pollution by 99 percent. When we recycle paper, we cut energy consumption by 40-50 percent and air and water pollution by about 35 percent, while employing more people.

We will use renewable resources at a rate less than or equal to the natural environment's ability to regenerate the resource. This means living off the income, not the capital, e.g., practicing sustainable forestry, sustainable fishing and sustainable agriculture. Every ton of paper made of recycled fiber saves seventeen trees and cuts air and water pollution 30-50 percent. Organic farming and agricultural production minimize the use of pesticides and fertilizers while conserving soil and water are safer and more sustainable.

We will rely directly on solar energy to drive our economic system. Over 85 percent of the world's energy comes from fossil fuels. This form of energy use causes major environmental and health problems such as black lung disease, air pollution, acid rain, oil spills and global climate change, to name a few. The desire for a continuing "cheap" supply of fossil fuels has had enormous military and economic costs to keep the oil and gas flowing around the world, especially from the Middle East. Moreover, this fossil fuel dependence is economically unsustainable for more than a few decades -- it took 10,000 days for nature to create the fossil fuels that society consumes in one day.

We will increase production of durable, repairable goods and eliminate persistent, toxic and bioaccumulative substances. At the same time, we will eliminate disposable goods as much as possible and detoxify the production process by minimizing the use and discharge of toxic substances. Products would be designed for disassembly so that the materials could be utilized in making new products. For example, several manufacturers (Volkswagen, Volvo, BMW) are redesigning automobiles so that 90 percent or more of the materials can be recycled into new automobiles. In 1993, the Gillette Company, one of the world's leading manufacturers of shaving equipment, had reduced its Toxic Release Inventory (US EPA definition) wastes in the United States by 97 percent from their 1987 level. According to Factor Four, between 1981 and 1993, Dow Chemical's Louisiana Division with 2,400 workers implemented 1,000 projects (costing under $200,000) to save energy or reduce waste. For the 575 projects subsequently audited, the average annual return on investment was 204 percent and the annual savings was $110 million.

We will focus on providing the ultimate ends of products or services not the products or services themselves. German chemist Michael Braungart and Bill McDonough have invented the concept of "products of service." A key to resource efficiency is to understand products as a means to deliver a service to a customer. For example, people do not want energy, they want the service it provides such as heat or light. Similarly, people want access to people, places, things and experiences not necessarily increased transportation. An example of a company that has adopted this idea is Interface, the largest commercial carpet tile company in the world which leases carpet through its Evergreen Lease Program. The lessee receives the service of the product -- warmth, softness, acoustic value and aesthetics for a fee. When the carpet is worn out, Interface takes it back and recycles it into new carpet.

All people will understand their connection to the natural world and to other humans. They will understand their "ecological footprint," i.e., they will know where products and services come from, where wastes go, and what they do to humans and other living species. They will appreciate that driving a car in Ohio may cause flooding in Bangladesh through global warming, or that cutting down forests in Brazil may deprive someone in Hungary of a lifesaving drug. For all people minimizing their ecological footprint and walking lightly on the planet will be second nature.

All current and future generations of humans will be able to meet their basic needs, pursue meaningful work and have the opportunity to realize their full human potential personally and socially. The average American receives 3,000 advertising messages per day oriented toward consumption. The American public is often portrayed as a group of consumers, not citizens. But increased consumption and material acquisition alone has not led to a happier, safer and more satisfied population in the United States. Nor has it done so elsewhere.

In June 1997, the prestigious Councils of the Royal Society of London and the United States National Academy of Sciences issued a statement expressing an urgent need for better understanding of human consumption and related behaviors and technologies, so that effective action may be taken to expedite the transition to a sustainable, desirable life for the world's people in the coming century. In the statement they said, "It has often been assumed that population growth is the dominant problem we face. But what matters is not only the present and future number of people in the world, but also how poor or affluent they are, how much natural resources they utilize, and how much pollution and waste they generate. We must tackle population and consumption together." Sufficiency of resource use and accumulation is as important as resource and productivity. Beyond meeting basic needs, we must examine nonmaterial ways to fulfill our needs for security, belonging, personal development and happiness that transcend materialism -- a goal of most major spiritual and religious movements.

We will have timely economic and social signals that encourage environmentally and socially sustainable behavior. The economic measures of success we use today, such as the GNP and consumer price index, discourage conservation and encourage waste, consumption, and the substitution of capital for jobs. The price of goods and services reflects all the profits to the producers but does not include all of the various social, environmental and health costs to society. In a sustainable society we would have more development, i.e., qualitative improvement in people and value added to resource use, than quantitative growth in resource and energy intensive economies. Several national and international

organizations and thousands of individuals have called for full cost accounting (including social and environmental) for economic activities, development of macroeconomic indicators which truly reflect societal well-being (e.g., Index for Sustainable Economic Welfare, Genuine Progress Indicator) and taxation which taxes the undesirables (energy and resource consumption) and not the desirable (employment and investment).

Nations would act like a Global Family. We must change the relationship between the developed and the developing countries. Industrial countries must reduce their consumption of the world's resources in the face of the desperate need of developing countries to improve health and to reduce poverty, social instability and population growth. A child born in the United States today will consume as much of the earth's resources and produce as much waste as more than five to ten children in India. We also need new approaches for transferring technology, for training and education, and for providing financial assistance to developing countries. These approaches must address population stabilization, improving the educational and social status of women, the international debt problem, and the need for sustainable economic strategies.

To ensure a realistic chance of realizing this vision of the sustainable future outlined above demands that all citizens understand the basic functioning of Earth's ecosystems and, especially, how humankind interacts with and is dependent upon the resources and services it provides. This is especially true for the future political, social and economic leaders emerging daily from our institutions of higher education. Unless higher education responds quickly to ensure that all of their graduates, regardless of their fields of study, are environmentally literate, then it is unlikely that our future leaders will demonstrate the analytical thinking, the will or the compassion to adequately address complex issues such as population, climate change and social equity. The instrumental role of higher education in moving society on a sustainable path and the changes which must take place within higher education in order to do so are discussed in the following section, "Higher Education for a Sustainable Future."

Higher Education for a Sustainable Future - The Role of Higher Education

Our current level of thinking remains a significant obstacle to the promise of a just and sustainable future. As Einstein observed, "the significant problems we face cannot be solved at the same level of thinking we were at when we created them." Our current mindset is characterized by the beliefs that

- humans are both separate from and the dominant species of nature;
- that resources are free and inexhaustible;
- that technological fixes are available to solve most problems; that nature has an infinite capacity to assimilate human waste; and
- that material acquisition and accumulation is the most important determinant of success.

As the primary centers of teaching, research and learning, institutions of higher education are significant leverage points which both reflect and inform social mindsets. The current educational system has helped bring us to the crossroads we currently face by endeavoring to educate our young in a manner which has reinforced an environmentally ignorant and/or insensitive mindset. Chet Bowers notes in Culture of Denial, "This is a

classic double bind situation where the promotion of our highest values and prestigious forms of knowledge serve to increase the prospects of ecological collapse." To capitalize on the influential position of higher education in pursuit of a sustainable future, however, will require significant changes within higher education. Bowers points out that, "as we learn more about changes occurring in degraded natural systems, as well as how human activities are changing weather systems that will in turn alter the distribution of species (and thus our patterns of dependence), framing the solution of the crisis in a way that does not involve a radical change in the conceptual and moral foundations of the educational process will only add to our problems" (11).

Many schools around the world are making important strides toward necessary changes in education. Some excellent examples of these changes in the United States include: the Georgia Institute of Technology which has made sustainable technology one of its three core missions for all aspects of their university from teaching to research and operations. In 1989, Tufts University became the first US university to make environmental literacy a goal for all graduates by creating the Tufts Environmental Literacy Institute. The Institute develops the capability of faculty from all disciplines to integrate environmental and sustainability concerns into their teaching. A consortium of seventeen colleges, based at Clark Atlanta University and that serve African American, Hispanic and Native American populations, has made significant changes in curriculum, operations and community outreach to promote environmental justice and sustainability. In the last three years, Northern Arizona University has revised eighty-eight courses from nearly every discipline to make environmental and sustainability concerns a central thrust in the curriculum (12). According to a recent report by the World Resources Institute, U.S. MBA programs at the forefront of education in business and the environment in 1998 include: George Washington University, New York University (Stern), Northwestern (Kellogg), the University of Michigan and others (see Grey Pinstripes, Green Ties) (13).

There is some excellent leadership by professional organizations such as the World Federation of Engineering Organizations (WFEO), the World Business Council for Sustainable Development (WBCSD) and United Nations Environment Programme (UNEP) to make sustainable development a high priority in engineering and business education. There have also been several international declarations signed by university leaders to make environmentally sustainable and just action a priority in higher education. For example, the Talloires Declaration, led in 1990 by the late Tufts President, Jean Mayer, has been signed by over 300 university presidents from over fifty countries (14).

Despite these efforts and those of a number of colleges and universities with active environmental studies programs that train graduate professionals, education and research about the interdependence of and a sustainable relationship between humans and the rest of the environment is not a priority in higher education. To date, no engineering school in the United States, with the exception of Georgia Institute of Technology, has made design for the environment, industrial ecology, pollution prevention or the relationship of technological development to sustainability a cornerstone of engineering education.

American medical students receive the equivalent of a single day of training in occupational and environmental medicine in four years of medical school. Only 100 out of 700 schools of business and management in North America have courses on business and the environment; the

majority of the courses are electives. Only 9 percent of teachers' colleges require a practicum in environmental education at the elementary level, and only 7 percent at the secondary level. This is all the more unfortunate in the United States since two-thirds of all the K-12 teacher positions will be replaced within the next eight to ten years (15).

As a result, the general public has little awareness that a healthy natural environment is essential to our very existence. We see ourselves as separate from the natural world and are unaware that it provides all the resources which make life possible while absorbing our wastes and enriching our lives with its incredible diversity of plants, animals and other species. Much of the population has little idea about where goods come from and where they go and the destructive impact of pollution on human health. We seem to believe that natural and physical resources are free and inexhaustible and that the environment can assimilate all our pollution and waste. The general public has little idea that it is not just industrial enterprise, but the aggregate of all human activities -- all the individual and the collective daily decisions -- that are irreversibly changing the Earth. Because of the underwhelming response of higher education to sustainability, the next generation of students will not be prepared with the analytical skills and practical knowledge to respond effectively and compassionately to the profound challenges of population growth, biotic degradation, soil erosion, public health, water shortages and the political instability resulting from these events.

Higher education has been so slow to respond because conventional logic and compartmentalization continue to be manifested throughout higher education institutions. A fundamental structural problem of the current educational system is the inclination to treat environmental education as yet another specialty, not unlike sociology or biology. The training of specialists is not an adequate response to the environmental problems we face. Specialists are produced with little feeling of connectedness, and little understanding of the workings of natural systems, or even the place of their own discipline in the larger human and non-human world. For example, neoclassical economics views the economic system as separate from the biosphere rather than one of its subsystems. As Herman Daly states, "Neoclassical economists look at the relationship between the economy and the biosphere like physicians who view a human body as having only a circulatory system and no digestive tract" (16). Engineers believe that most human-based technology is an improvement over "natural technology" and feed economists' assumptions that science and technology can substitute for any resource we deplete or species or ecosystem we destroy. Interconnecting patterns and relationships which govern all natural and most human interactions are largely left to the student to discern on his or her own. Environmental specialists alone will not help us move toward a sustainable path. A compartmentalized approach further reinforces the assumption that environmental protection should be left to environmental professionals. All humans consume resources, occupy ecosystems and produce waste. We need all professionals to carry out their lives and activities in a manner that is environmentally sound and sustainable.

Moreover, teaching and learning predominantly takes place in the classroom, rather than being balanced by experiential and service learning opportunities. Curriculum and degree requirements are primarily determined by faculty isolated by department and school of study, and/or designed to satisfy accrediting agencies rather than generating students with skills truly relevant to society's needs. Learning is fragmented, and faculty, responding to long-established incentives and professional

practices, particularly those associated with tenure and promotion, are discouraged from extending their work into other disciplines or inviting interdisciplinary collaboration. Furthermore, campus operations and investments are based on conventional economic thinking rather than sustainable practices (which also have proven economically beneficial), and both remain disconnected from the formal learning process.

Interactions between human populations and the environment, and the development of strategies, technologies and policies to create an environmentally just and sustainable future, however, are among the most complex issues with which society must deal. These issues necessarily cross over disciplinary boundaries, making it very difficult to convene the skills necessary for effective teaching and research in educational institutions that are organized into highly specialized areas of knowledge and traditional disciplines. Reflecting our compartmentalized education, we continue to address specific environmental problems, rather than to devise a coherent and consistent approach guided by a unifying vision of a sustainable future.

The larger goal of shifting the thinking, values and actions of all individuals and institutions worldwide demands a long-term societal effort aimed at making environmental and sustainability concerns a central theme in all education. If we are to achieve a sustainable future, institutions of higher education must provide the awareness, knowledge, skills, and values that equip individuals to pursue life goals in a manner that enhances and sustains human and non-human well-being. The 3,800 institutions of higher education in the United States are unparalleled in their potential to prepare most of the professionals who develop, manage, teach in and influence society's institutions.

Institutions of higher education bear a profound moral responsibility to increase society's ability to create a just and sustainable future. Society has conveyed a special charter on institutions of higher learning. Within the United States, higher education institutions are allowed academic freedom and a tax-free status to receive public and private resources in exchange for their contribution to the health and well-being of society through the creation and dissemination of knowledge and values. These institutions have the mandate and potential to develop the intellectual and conceptual framework for achieving this goal. Higher education institutions are significant but largely overlooked leverage points in the transition to a sustainable world -- they influence future leaders through their students and current leaders through their alumni -- and must play a strong role in education, research, policy development, information exchange and community outreach and support. They have the unique freedom to develop new ideas, comment on society, engage in bold experimentation, as well as contribute to the creation of new knowledge.

The crisis of the environment, according to David Orr, Professor and Chair, Department of Environmental Studies at Oberlin College, is symptomatic of a prior crisis of mind, perception, and heart." Orr argues therefore, that this crisis, "is not so much a problem in education but a problem of education" (17). The question which arises at this point is: What would a college or university which addressed the environmental crisis with intensity and ingenuity look like? In an online article entitled, The University as a Model of Sustainability, Second Nature has attempted to broadly define the characteristics of a university in which sustainability is the lens through which it sees itself and the principle according to which it decides how to act. We hope this vision will spark ideas and provide some insight into how a sustainability perspective can be translated into action

on the college and university campus. We hope you will provide your feedback on our thoughts so that together we can further refine our ideas and advance the Education for Sustainability movement.

References

1 Brown, Lester R., State of the World, "The Future of Growth" (New York: Worldwatch Institute, 1998), p. 3.
2 Human Development Report 1996. United Nations Development Programme (Oxford University Press, 1996), p. 170.
3 Roberts, Don V. "Civil Engineering - The Changing Profession," Eighth Annual Stanley D. Wilson Memorial Lecture, University of Washington, May 2, 1996.
4 Meadows, Donella, Dennis Meadows and Jorgen Randers. Beyond the Limits: Executive Summary. (Post Mills, VT: Chelsea Green Publishing Co., 1992), p. 7.
5 Personal communication with Paul Hawken.
6 Renner, Michael. State of the World, "Transforming Security" (New York: Worldwatch Institute, 1997),
p. 124.
7 The Natural Step newsletter, Fall 1998, Volume 1, number 7.
8 Cairnes, Jr., John. "Defining Goals and Conditions for a Sustainable World." Environmental Health Perspectives, vol. 105, no. 11, Nov. 1997, p.1165.
9 von Weizsacker, Ernst, Amory B. Lovins and L. Hunter Lovins. Factor Four: Doubling Wealth, Halving Resource Use, (London: Earthscan Publications, Ltd., 1997), pp. xx-xxi.
10 Raloff, J. "Energy efficiency: less means more," Science News. vol. 133, 1988, p. 129.
11 Bowers, C.A. The Culture of Denial (Albany: State University of New York Press, 1997) pp. 2-3, emphasis added.
12 Second Nature's EFS Profiles Database
13 Finlay, Jennifer, et. al. Grey Pinstripes, Green Ties: Executive Summary. World Resources Institute, Washington, DC, 1998, p. 7.
14 Talloires Declaration.
15 Gabriel, Nancy. Teach Our Teachers Well: Strategies to Integrate Environmental Education into Teacher Education Programs, a Second Nature report prepared for W. Alton Jones Foundation, 1996, p. 4.
16 Personal communication.
17 Eagan, David J. and David W. Orr, eds. New Directions for Higher Education: The Campus and Environmental Responsibility (San Francisco: Jossey-Bass Publishers, Spring 1992), no. 77, p. 4.

© 2001 Second Nature, Inc.